Staff Report

Tinemaha Reservoir, Inyo County

Recommendation to Remove Tinemaha Reservoir from the Clean Water Act Section 303(d) List of Impaired Waterbodies

California Regional Water Quality Control Board
Lahontan Region
2501 Lake Tahoe Boulevard
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Table of Contents

Tables and Figures

1. INTRODUCTION

Section 305(b) of the Clean Water Act (CWA) mandates biennial assessment of the nation's water resources, and these water quality assessments are used to identify and list those waters that are not achieving water quality standards. The resulting list is referred to as the 303(d) list. The CWA also requires States to establish a priority ranking for these impaired waters and to develop Total Maximum Daily Loads (TMDLs). A TMDL specifies the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and it allocates pollutant loadings to point and non-point sources such that those standards will be met.

Tinemaha Reservoir was listed as impaired in 1994 due to elevated arsenic concentrations detected during 1991 water quality sampling for the *Mono Basin Water Rights Environmental Impact Report* (Jones and Stokes Assoc., 1993). The 1994 303(d) list also described the arsenic listing as a "metals" impairment (arsenic is a metalloid element). Because the arsenic detected in the reservoir is naturally occurring, the arsenic impairment listing was removed during the 2002 303(d) listing cycle. However, the reservoir owners, the Los Angeles Department of Water and Power (LADWP), routinely monitor water quality at the reservoir's outlet for various constituents, including copper. These data indicated exceedances of California Toxics Rule (CTR) aquatic life protection criteria for copper, so the "metals" impairment was refined to the more specific "copper" designation and the reservoir remained on the 303(d) list. LADWP historically applied copper sulfate to the reservoir to control algae blooms, which can impart foul taste and odor in the drinking water supply if left untreated.

As a first step in TMDL development, Regional Board and LADWP staff developed a sampling plan to determine the current concentrations of dissolved copper in the major tributary entering the reservoir and at the reservoir outlet. Following a ten-month copper sampling program, the data show that the reservoir is in compliance with water quality standards for total and dissolved copper. Therefore, Regional Board staff recommend that Tinemaha Reservoir be removed from the 303(d) list during the next listing cycle. The purpose of this report is to provide supporting data to justify the removal of the reservoir from the 303(d) list. Future copper sulfate applications to control algae will be conducted and monitored as outlined in the National Pollution Discharge Elimination System (NPDES) Aquatic Pesticides General Permit Monitoring and Reporting Program for Tinemaha Reservoir, discussed in further detail in Section 6.

2. PROJECT AREA DESCRIPTION

2.1. Location and Geography

Tinemaha Reservoir is located in the Owens Valley just east of Highway 395 in Inyo County, about 7 miles south of the town of Big Pine. Figure 1 shows the reservoir's location. The Owens Valley is characterized as high desert rangeland, with valley floor elevations ranging from 6,000 feet above mean sea level (amsl) near Mono Lake to about 3,500 feet amsl at Owens (dry) Lake. The mountains that surround the watershed rise more than 9,000 feet from the valley floor and

include Mount Whitney at 14,494 feet amsl, the highest mountain in the contiguous United States. The major river in the watershed is the Owens River, which meanders southward through the valley. The headwaters of the Owens River are in the Long Valley area, in the northern portion of the Owens River watershed.

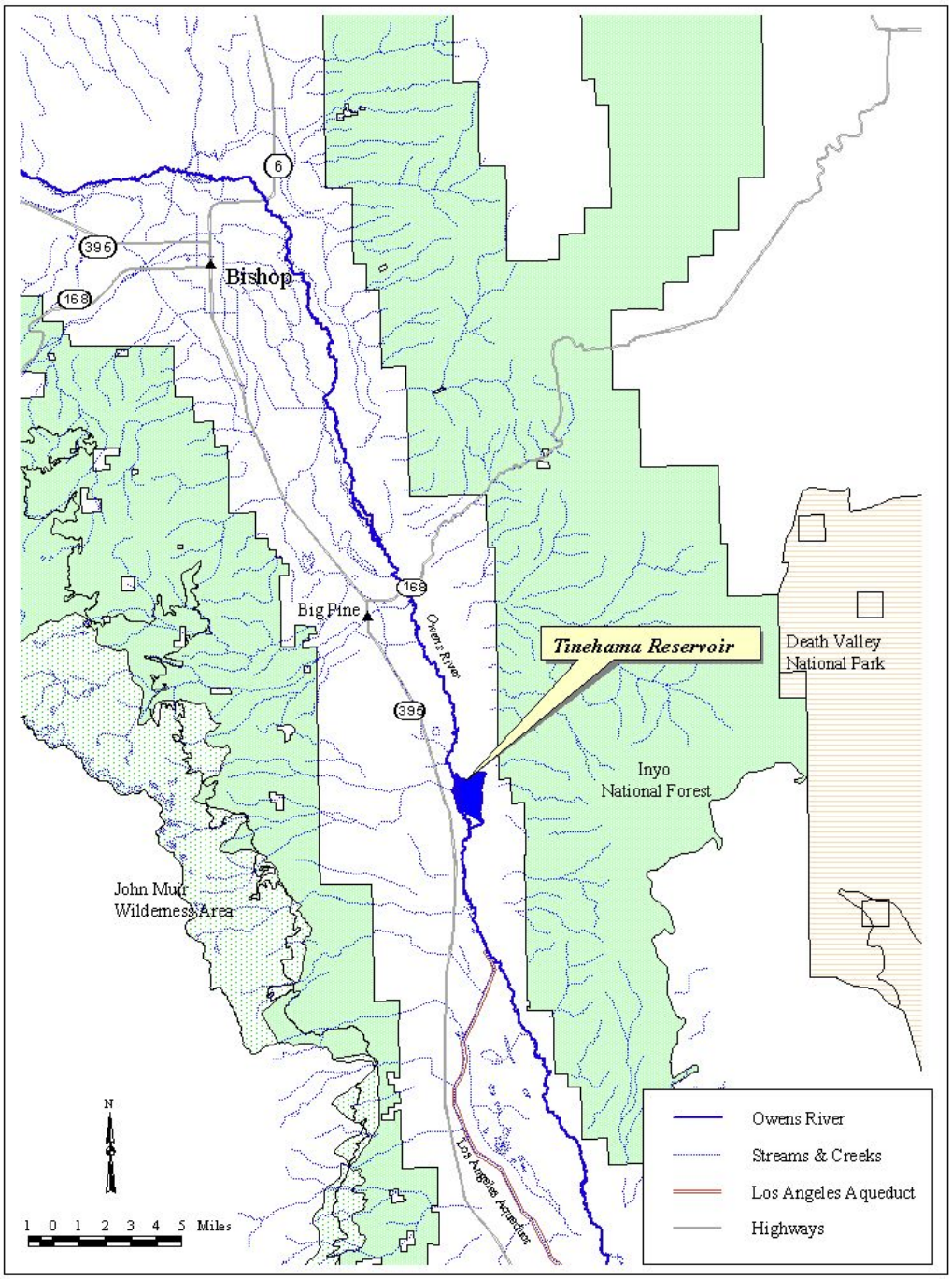

Figure 1. Tinemaha Reservoir Location Map.

2.2. Waterbody Description and Water Uses

Tinemaha Reservoir is one of several reservoirs in the LADWP's Owens River/Los Angeles Aqueduct municipal water supply system. It receives inflow from the Middle Owens River and Tinemaha Creek. It was constructed to provide short-term regulation of the Owens River before it is diverted into the Los Angeles Aqueduct (LAA), about 5 miles downstream of the reservoir outlet. Tinemaha Reservoir has a surface area of 2,098 acres and a drainage area of 1,915 square miles. The average depth of the reservoir at normal operating elevations ranges from three to five feet. The maximum storage is about 16,000 acre feet, although earthquake safety concerns have limited the useable storage to 10,000 acre feet in recent years.

Below Tinemaha Reservoir, flow in the Owens River continues for approximately 5 miles before nearly all the water is diverted into the unlined channel of the LAA at the Aberdeen intake. South of the intake, partial flows are maintained in the natural channel of Owens River by groundwater contributions and intermittent operational releases from the LAA. On its way to Los Angeles, water from the LAA passes through 11 power plants to supply the needs of 220,000 homes. Annual water demands in Los Angeles are about 660,000 acre-feet with an average per capita use of 150 gallons per day. About two-thirds of the City's demand is for residential uses, almost equally shared by single-family and multi-family units. About one quarter of the demand is for commercial and governmental uses, with a very small amount used by industry. The City's water demand is expected to grow to 756,000 acre-feet per year by 2015, an increase to support the projected population of 4,550,000 (LADWP, 1996).

In-valley uses of water include local municipal needs, stockwater, irrigation of pastures, and cultivation of alfalfa. About 190,000 acres of the Owens Valley floor are leased by the LADWP to ranchers for grazing, and about 12,400 additional acres is leased for growing alfalfa. Several Owens Valley fish hatcheries (Fish Springs, Blackrock, and Mt. Whitney) also rely on ground and surface water for their needs. Since the early 1900s, water use in the Owens Valley has changed from meeting local needs to exporting a greater quantity of both ground and surface water.

LADWP allows fishing and float tubing on Tinemaha Reservoir; however, the use of the reservoir by the public for recreation is minimal due to the weather conditions, lack of shade and prohibitions on camping or boating.

3. WATER QUALITY STANDARDS, BENEFICIAL USES AND 303(D) LISTING BASIS

3.1. Water Quality Standards

The 1995 Water Quality Control Plan for the Lahontan Region (Basin Plan) specifies water quality standards that are protective of beneficial uses for all waters in the Lahontan Region, including Tinemaha Reservoir. Water quality standards relevant to the copper impairment include CTR aquatic life protection criteria and Department of Health Services/US EPA primary and secondary drinking water standards. Specific water quality objectives for the Owens River

at the Tinemaha Reservoir outlet are defined in the Basin Plan for total dissolved solids, chloride, sulfate, fluoride, boron, nitrogen as nitrate, total nitrogen and dissolved orthophosphate; however, they are not relevant to the copper listing.

The Basin Plan narrative water quality objective for pesticides (including copper sulfate) is applicable to all inland surface waters of the Lahontan region. It states:

> *"Pesticide concentrations, individually or collectively, shall not exceed the lowest detectable levels, using the most recent detection procedures available. There shall not be an increase in pesticide concentrations found in bottom sediments. There shall be no detectable increase in bioaccumulation of pesticides in aquatic life."*

The State Water Resources Control Board's (SWRCB*) State Implementation Policy* for the CTR contains a provision to allow a categorical exception from water quality criteria and objectives, including Basin Plan objectives such as the one outlined above, for priority pollutants for the application of aquatic pesticides. In July 2001, the SWRCB adopted a Statewide General NPDES permit for Discharge of Aquatic Pesticides, based on this categorical exemption. LADWP has applied for coverage under the General Permit, and submitted a Monitoring and Reporting Plan (MRP) which has been reviewed and approved by Regional Board staff. Details on the General Permit and MRP requirements are contained in Section 6, Monitoring/Future Actions.

The following Basin Plan narrative water quality objective for toxicity is applicable to all inland surface waters of the Lahontan Region:

> *"All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life."*

The CTR aquatic life protection criteria are toxicity-based, and are used to implement the narrative toxicity standard. Compliance with CTR criteria is considered adequate to meet the narrative toxicity standard.

3.2. Beneficial Uses

According to the Basin Plan, the beneficial uses of Tinemaha Reservoir are:

- Municipal and Domestic Supply (MUN)
- Agriculture Supply (AGR)
- Groundwater Recharge (GWR)
- Water Contact Recreation (REC-1)
- Non-contact Water Recreation (REC-2)
- Commercial and Sportfishing (COMM)
- Cold Freshwater Habitat (COLD)
- Wildlife Habitat (WILD)

- Rare, Threatened, or Endangered Species (RARE)

3.3. Beneficial Use Impairment

The preservation and enhancement of aquatic habitats and communities, including invertebrates, is a vital element of the COLD beneficial use. Copper sulfate applications may result in conditions toxic to benthic invertebrates and fish. Copper accumulation in the sediments and the food chain may result in negative impacts to the diversity and viability of aquatic life, impacting the reservoir's wildlife habitat and fishery.

LADWP historically has used copper sulfate in the reservoir to control algae, although the frequency of treatments have tapered off significantly in recent years and no copper sulfate was applied in 2002 or 2003. According to routine monitoring data collected by LADWP at the reservoir outlet from 1991 through 2000, twenty nine percent of the total copper samples exceeded the CTR chronic aquatic life criteria of 7.8 micrograms per liter dissolved copper (based on a median hardness value of 84 milligrams per liter calcium carbonate). Figure 2 shows historical total copper concentrations, corresponding CTR dissolved criteria, and copper sulfate application dates.

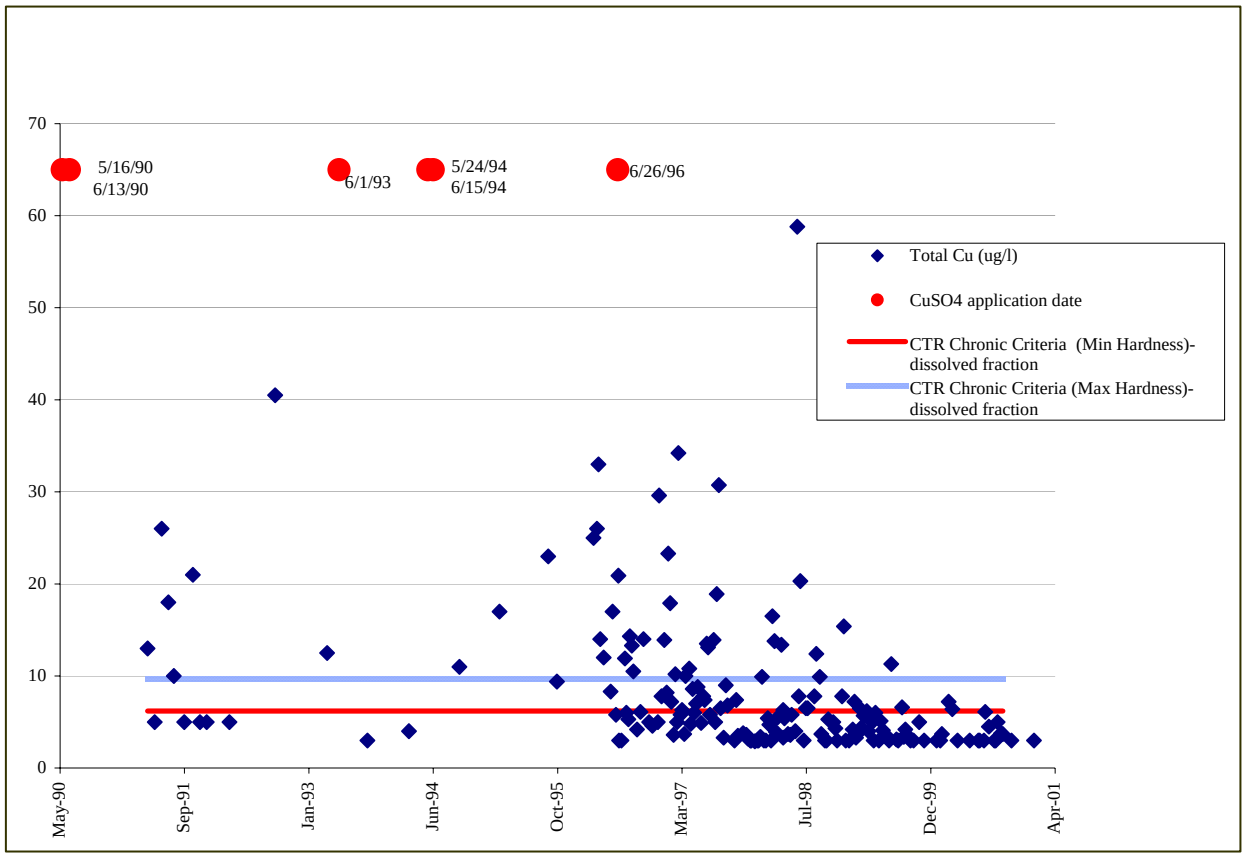

Figure 2. Historic Total Copper Concentrations, Copper Sulfate Application Dates, and CTR Chronic Dissolved Copper Criteria (shown for minimum and maximum hardness values).

4. CURRENT CONDITIONS

The first step in the TMDL process for Tinemaha Reservoir was an assessment of current dissolved copper concentrations and hardness values. Monitoring data that provided the 303(d) listing basis were expressed as total copper concentrations, with little concurrent hardness data or information regarding quality control procedures. This is problematic since the most relevant water quality objectives for copper, California Toxics Rule (CTR) aquatic life criteria, are expressed in the dissolved fraction of copper, which are typically found at lower levels than total copper concentrations. Also, low-level metals sampling should follow stringent quality control procedures during sampling and analysis to avoid sample contamination that may affect the reliability of data. Other data gaps included a lack of concurrent hardness data needed to interpret hardness-based CTR criteria.

LADWP sampled seven stations along the Owens River system from January through October 2002, as part of a copper sources investigation, initiated in response to elevated copper concentrations detected in the LAA during the Haiwee Reservoir Copper TMDL source analysis. Sampling stations were positioned along the Owens River/LAA system from Big Pine Creek, north of Tinemaha Reservoir, to the Los Angeles Aqueduct at Cottonwood Power Plant south of the town of Lone Pine. All seven stations were sampled two times per month for total copper, temperature, pH, conductivity and alkalinity. Table 1 shows total copper concentrations measured at Stations 2 and 3, near the inlet and at the outlet of Tinemaha Reservoir.

Table 1. Total Copper Concentrations above and below Tinemaha Reservoir, 2002.

Tinemaha Reservoir Total Copper Concentrations		
Sample Date	**Station 2 Owens River above Tinemaha Res**	**Station 3 Tinemaha Res Outlet**
01/15/02	16.6[1] (44.3[2])	ND[3]
01/30/02	ND	ND
02/13/02	3.6	ND
02/26/02	ND	3
03/14/02	ND	ND
03/27/02	ND	ND
04/09/02	ND	ND
04/23/02	ND	ND
05/08/02	3.1	ND
05/21/02	ND	ND
06/06/02	ND	ND
06/19/02	ND	ND
07/02/02	ND	ND
07/16/02	ND	ND
08/01/02	ND	ND
08/21/02	ND	ND
09/03/02	ND	ND
09/18/02	ND	ND
10/01/02	ND	ND
10/16/02	ND	ND
10/29/02	ND	ND
11/07/02	ND	ND

[1] High concentration may be due to inadequate sample bottle preparation, which was enhanced with an additional acid wash after first sampling event when travel blanks had detectable total copper concentrations.
[2] Replicate Sample.
[3] ND = not detected at a detection limit of 3 micrograms per liter.

To evaluate current dissolved copper concentrations in the reservoir, LADWP also collected dissolved copper and hardness measurements beginning in August 2002, to compare with CTR hardness-based copper criteria. Sampling results indicated that dissolved copper was not detected (at a detection limit of 3 micrograms per liter) at Stations 2 and 3. Table 2 shows sampling results for these stations, hardness values, and corresponding CTR criteria.

Table 2. Dissolved Copper and Hardness Data, with Corresponding CTR Criteria.

	08/21/02	09/03/02	09/18/02	10/01/02	10/16/02	10/29/02	11/07/02
Owens River near Reservoir Inlet							
Dissolved Copper	ND[1]	ND	ND	ND	ND	NO DATA	ND
Hardness (mg/L $CaCO_3$)	60.4	78.4	78.8	72.8	73	74	75.6
CTR Chronic Criteria[2]	5.8	7.4	7.4	6.6	7	7	7
At Reservoir Outlet							
Dissolved Copper	ND	ND	ND	ND	ND	NO DATA	ND
Hardness (mg/L $CaCO_3$)	77.6	77.2	80.4	78.4	74	77.2	74.4
CTR Chronic Criteria	7.4	7	7.4	7.4	7	7	7

[1] ND = not detected at a detection limit of 3 micrograms per liter.

[2] CTR chronic copper criteria are the most stringent applicable criteria for copper, and vary based on water hardness.

5. SAMPLING METHODS AND QUALITY CONTROL/QUALITY ASSURANCE

5.1. Bottle Preparation

Copper samples were collected in high density polyethylene (HDPE) bottles prepared in LADWP's Water Quality Laboratory for metals analysis. Sample bottles were acid washed, rinsed in tap water, and rinsed twice from the Lab's reverse osmosis (RO) treatment unit. Sample bottles were then oven-dried and stored in enclosed cabinets.

5.2. Sampling Procedures

Samples were collected from as near the middle of the stream as possible at a depth of two feet below the water surface. All samples were grab samples, collected using a sample pole that holds the sample bottle directly, to reduce the possibility of contamination. Sampling personnel wore talc-free latex gloves for sample collection and handling. "Clean" sampling techniques for trace metals sampling were used to the extent practicable.

5.3. Travel Blanks and Duplicate Samples

Two travel blanks for copper using copper sample bottles and RO water were prepared prior to leaving the lab. Travel blanks accompanied all copper samples bottles and were handled the same way. An additional copper sample (duplicate) was collected from one randomly selected sample site during each event.

5.4. Sample Analysis

All samples were transported to the LADWP lab within 24 hours of collection and logged into the Lab's Information Management System. All samples were accompanied by a Chain of Custody form. Samples were analyzed in the lab, which is accredited by the California Department of Health Services (DOHS) under the Environmental Laboratory Accreditation Program (ELAP). Total and dissolved copper samples were analyzed using Method 3113B from Standard Methods on a Perkin-Elmer Model 4100 atomic adsorption furnace with a detection limit of 3 micrograms per liter.

5.5. Atomic Adsorption Furnace Calibration and Data Validation

The furnace was calibrated for each batch of copper samples as follows:

- A calibration curve is created using lab-prepared known copper concentrations.
- The calibration curve is checked using commercially prepared copper standards.
- The results from the commercially prepared copper standard are compared against another commercially prepared standard from a different source.
- A reagent blank is analyzed to ensure that the reagents and sample preservatives are free from contamination.
- A spiked sample is prepared and analyzed to determine percent recovery.
- All samples, blanks, and duplicate samples are analyzed twice.
- All analytical results are reviewed by the analyst.

All reviewed analytical results are validated by the lab supervisor staff (LADWP, 2001).

6. MONITORING PLAN AND FUTURE ACTIONS

In July 2001, the State Water Resources Control Board (SWRCB) adopted an interim NPDES permit for Discharge of Aquatic Pesticides (General Permit No. CAG990003). The General Permit was developed on an emergency basis to provide coverage for broad categories of aquatic pesticide use as a result of the Ninth Circuit Court's Talent decision (Headwaters, Inc. v. Talent Irrigation District, 2001), which required that discharges of pollutants from the use of aquatic pesticides require coverage under an NPDES permit.

The permit grants a categorical exception from the water quality criteria and objectives for priority pollutants for the application of aquatic pesticides. This exception is short-term (including seasonal) and applies only during and following the use of aquatic pesticides. Any impacts on beneficial uses must be temporary in nature and must allow for full restoration of pre-project water quality and protection of beneficial uses. Effluent limitations are narrative and include requirements to implement appropriate best management practices and comply with all pesticide label requirements. Coverage is available to "public entities" for resource or pest management, based on the provisions of the SWRCB's State Implementation Policy of the CTR, and LADWP applied for coverage under the General Permit in October 2001.

Because the General Permit was developed on a emergency basis, it was issued as a limited term permit and expired on January 31, 2004. The SWRCB is conducting hearings on the adoption of a new General NPDES Permit for aquatic weed and pest control. The new permit will require additional documentation from applicants to fulfill California Environmental Quality Act (CEQA) requirements. LADWP has indicated that they intent to seek continuing coverage under the new permit, and have begun the initial study process to facilitate CEQA analysis.

The General Permit's Monitoring and Reporting Program (MRP) requires that dischargers submit a monthly report to the appropriate RWQCB documenting specific information regarding each

aquatic pesticide use site. The discharger must also submit an annual report which summarizes the objectives of the MRP, results, and interpretation of data. LADWP submitted an MRP in 2002, specifically for copper sulfate applications in Tinemaha Reservoir. The approved MRP includes extensive pre- and post-copper sulfate application water sampling, reporting, and language to trigger future water column and/or sediment toxicity testing, depending on frequency of copper sulfate treatments.

LADWP has submitted the required monthly and annual Pesticide Use Reports, which show that copper sulfate has not been applied to the reservoir since 2002.

7. RECOMMENDATION

Based on the information summarized in this report, Regional Board staff determined it is appropriate to remove Tinemaha Reservoir from the CWA Section 303(d) list of impaired waterbodies during the next 303(d) listing cycle, which is currently scheduled for June 2004.

8. REFERENCES

Los Angeles Department of Water and Power, *Unidentified Copper Sources Investigation Study Plan*, December, 2001.

----------, *Water Supply Fact Sheet*, 1996. Available at http://www.ladwp.com/water/supply/facts/index.htm.

Jones and Stokes Associates, *Mono Basin Environmental Impact Report*, May 1993. Chapters 3 A, 3B, Appendix T.